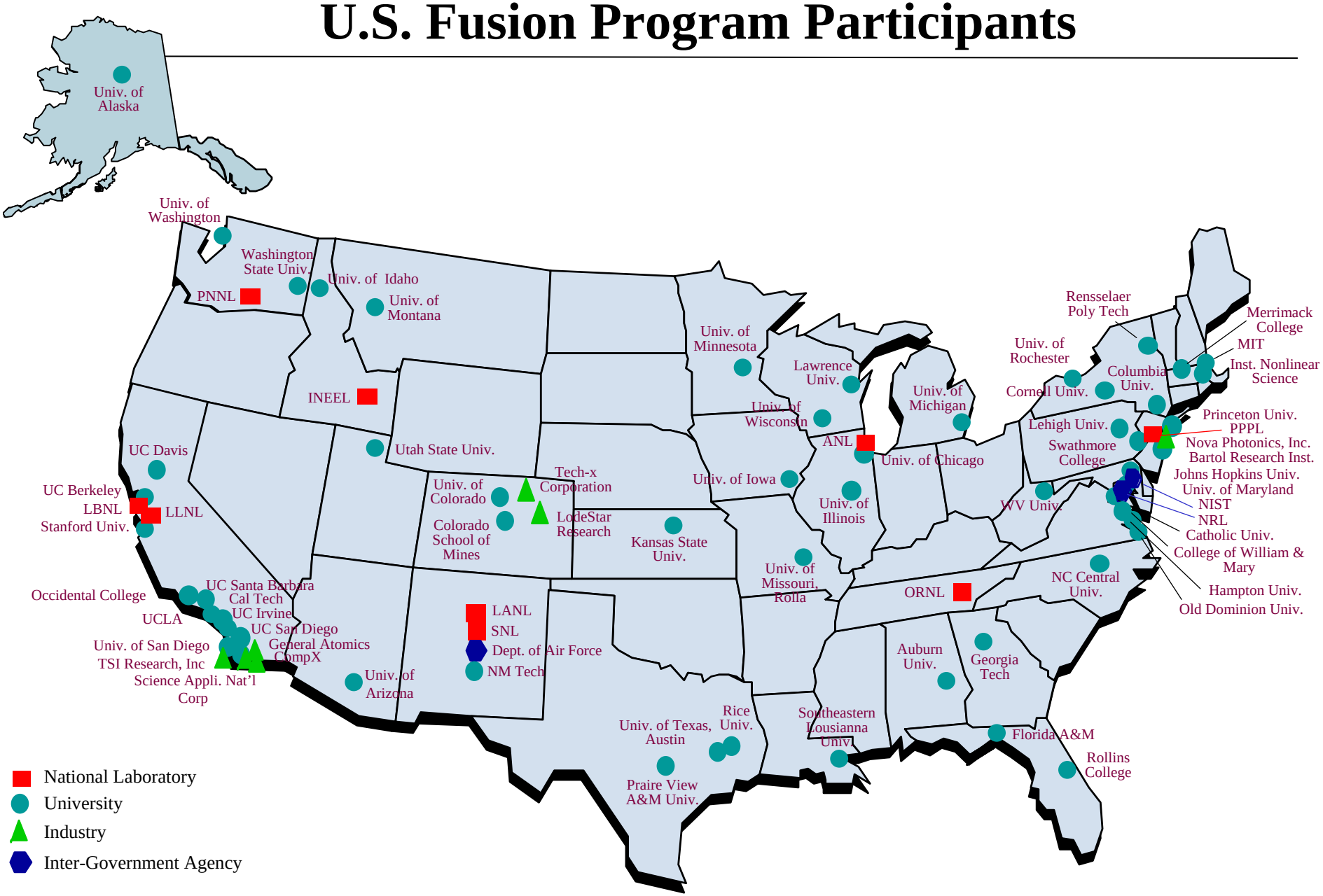
Basic Information About Fusion

U.S. Fusion Energy Sciences Program Mission

"Advance plasma science, fusion science, and fusion technology-- the knowledge base needed for an economically and environmentally attractive fusion energy source."

U.S. Fusion Program Participants



The Administration on Fusion

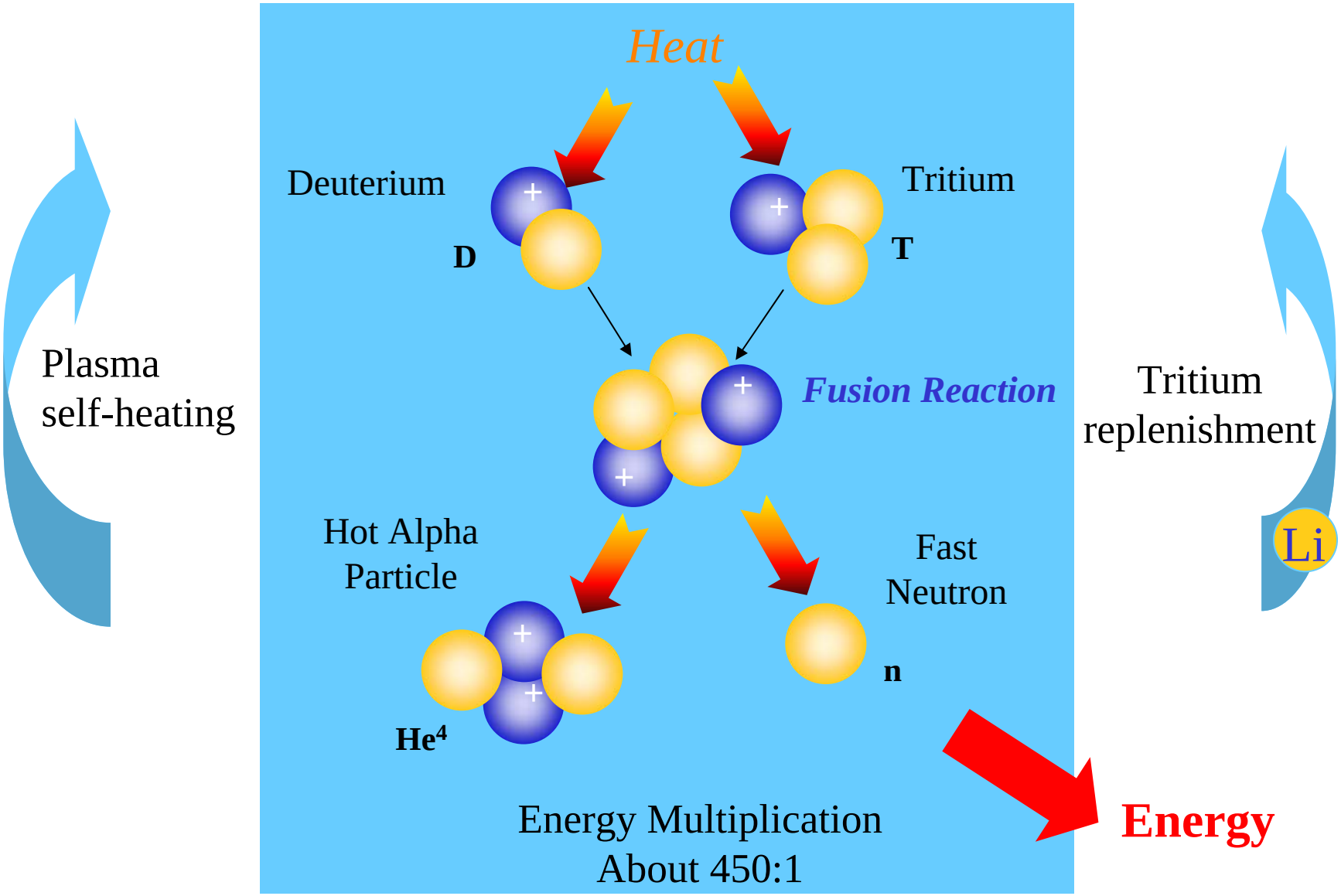
"The NEPD Group recommends that the President direct the Secretary of energy to develop next-generation technology - including hydrogen and fusion." *National Energy Policy*

"The results of ITER will advance the effort to produce clean, safe, renewable, and commercially-available fusion energy by the middle of this century. Commercialization of fusion has the potential to dramatically improve America's energy security while significantly reducing air pollution and emissions of greenhouse gases."
President George W. Bush

"By the time our young children reach middle age, fusion may begin to deliver energy independence… and energy abundance… to all nations rich and poor. Fusion is a promise for the future we must not ignore. But let me be clear, our decision to join ITER in no way means a lesser role for the fusion programs we undertake here at home. It is imperative that we maintain and enhance our strong domestic research program… . Critical science needs to be done in the U.S., in parallel with ITER, to strengthen our competitive position in fusion technology." *Former Secretary of Energy Spencer Abraham*

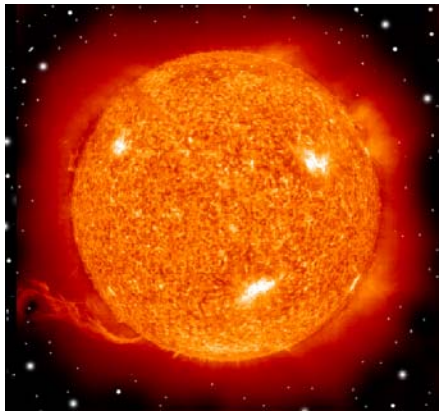
"We're also supporting the International ITER Partnership to look at long-ranging research in the area, for example, of magnetic fusion, designed to [demonstrate] the practicality of fusion power by the middle of this century."
Vice President Dick Cheney

Deuterium-Tritium Fusion Reaction

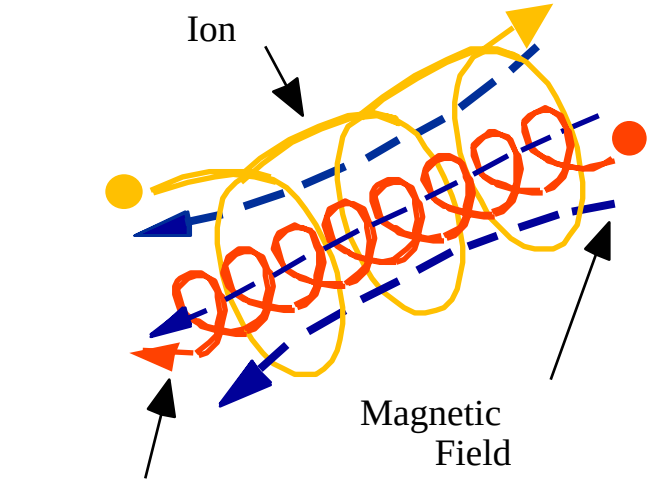


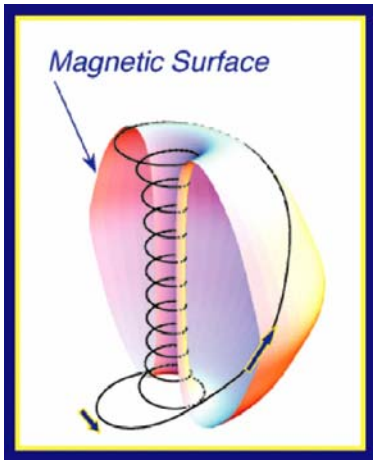
Three Confinement Approaches

Gravitational

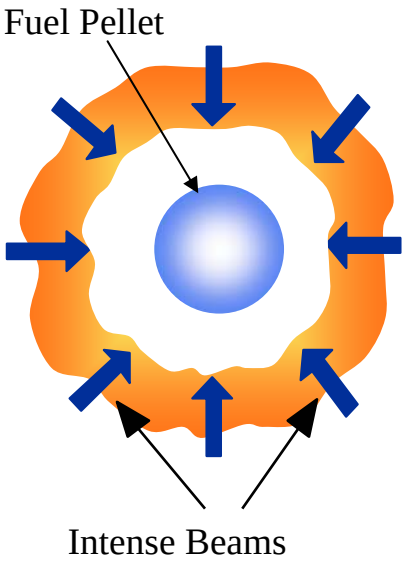


Magnetic



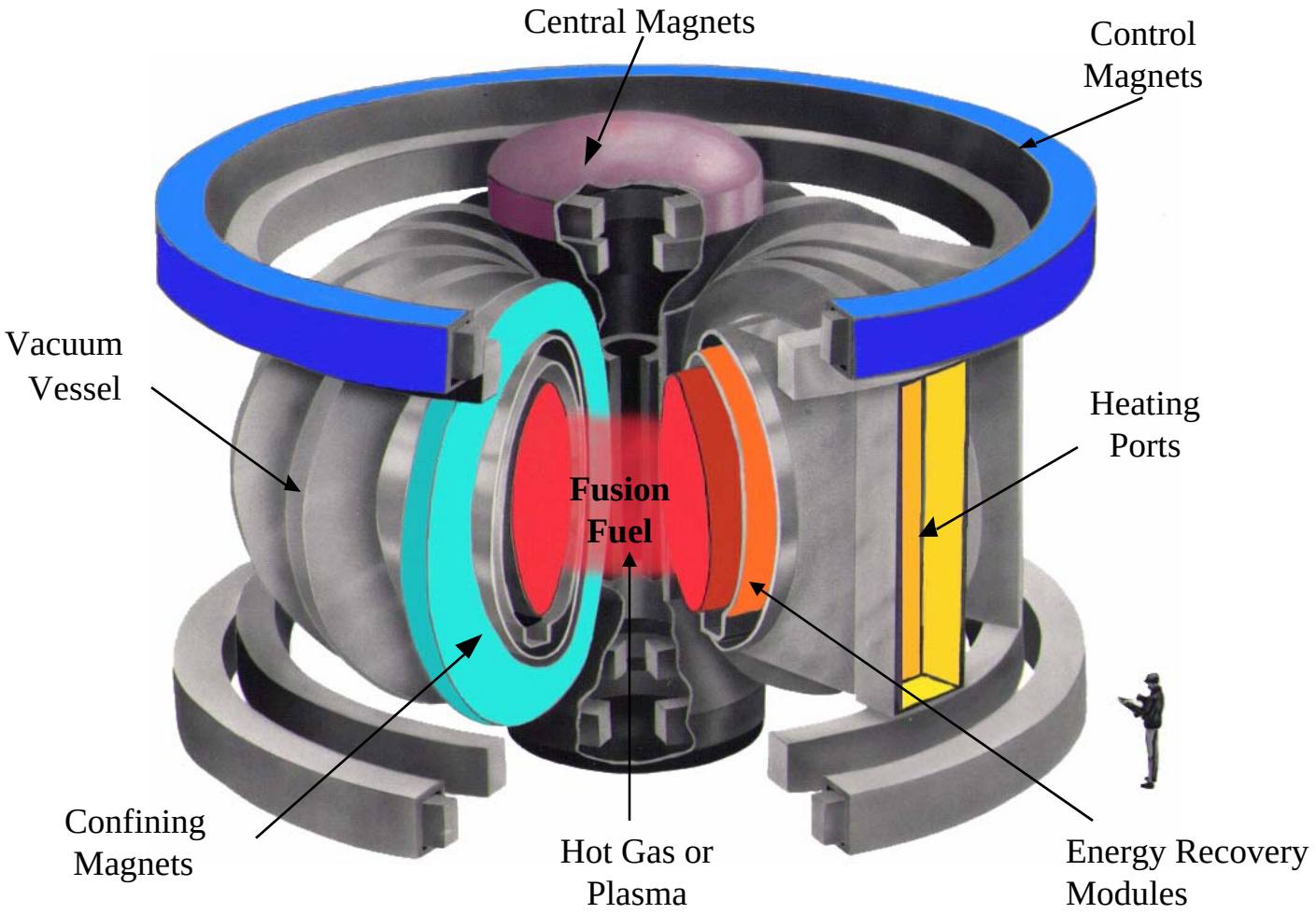


Inertial



Plasma science also has impacts far beyond fusion energy -- in astrophysics, computer chip processing, space propulsion…

Most Developed Fusion Concept is the Tokamak



Fusion is an Attractive Domestic Energy Source

- Abundant fuel, available to all nations
  - Deuterium and lithium easily available for thousands of years
- Environmental Advantages
  - No carbon emissions, short-lived radioactivity
- Can't blow up, resistant to terrorist attack
  - Less than 5 minutes of fuel in the chamber
- Low risk of nuclear materials proliferation
  - No fissile or fertile materials required
- Compact relative to solar, wind and biomass
  - Modest land usage
- Not subject to daily, seasonal or regional weather variation
  - No large-scale energy storage nor long-distance transmission
- Cost of power estimated similar to coal, fission
- Can produce electricity and hydrogen
  - Complements other nearer-term energy sources